WHAT IS CLAIMED IS:

1. A separation apparatus comprising:

a channel through which a sample containing components-to-be-separated moves;

one, or two or more check valves disposed in said channel, suppressing back flow of said components-to-be-separated;

a plurality of compartments partitioned by said check valve(s); and

an external force imposing unit imposing external force to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force imposing unit has a function of alternately executing a first external force imposing pattern by which the external force is imposed to said components-to-be-separated in the forward direction along said channel, and a second external force imposing pattern by which the external force is imposed to said components-to-be-separated in the direction opposite to the forward direction along said channel, to thereby fractionate said components-to-be-separated into any of said compartments.

2. The separation apparatus according to Claim 1, wherein said channel is formed so as to extend in a straight form.

3. The separation apparatus according to Claim 1 or 2, wherein said check valves are formed so as to block back flow of at least

a part of said components-to-be-separated flew through each of said check valves and moved to the downstream side of said channel.

4. The separation apparatus according to any one of Claims 1 to 3, wherein said external force imposing unit includes a plurality of electrodes provided to both ends of said channel, and has a function of executing said first external force imposing pattern and said second external force imposing pattern by changing direction of voltage to be applied between said electrodes.

5. A separation apparatus comprising:

a channel through which a sample containing components-to-be-separated moves;

interception units intercepting said components-to-be-separated moving through said channel in the sample forwarding direction of said channel;

a plurality of compartments partitioned by adjacent ones of said interception units; and

an external force imposing unit imposing external force to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force imposing unit has a function of sequentially executing a plurality of external force imposing patterns differing in external force component in the sample forwarding direction in the channel in the individual compartments, so as to fractionate said components-to-be-separated into any of said compartments.

6. The separation apparatus according to Claim 5, wherein said external force imposing unit is configured to impose external force so as to substantially equalize magnitude of the external force imposed to said components-to-be-separated in each of said compartments.

7. The separation apparatus according to Claim 5 or 6, wherein said external force imposing pattern is such as imposing external force so that the compartments expressing a positive external force component and the compartments expressing a negative external force component alternately appear along the sample forwarding direction of said channel.

8. The separation apparatus according to any one of Claims 5 to 7, wherein said channel has a bent geometry, and a bent portion of said channel configures said interception unit.

9. The separation apparatus according to Claim 8, wherein said bent portion is formed substantially at right angles.

10. The separation apparatus according to any one of Claims 5 to 9, further comprising recovery units recovering said components-to-be-separated fractionated into said individual compartments from said interception units,

wherein said external force imposing unit imposes external force also between each of said recovery units and said interception

units, so as to move said sample towards said interception unit during fractionation of said sample, and so as to move said sample towards said recovery unit during recovery of said sample.

11. The separation apparatus according to any one of Claims 1 to 10, wherein said plurality of compartments placed along the sample forwarding direction of said channel are configured so that the one placed on the further downstream side of said channel has a larger length.

12. The separation apparatus according to any one of Claims 1 to 11, wherein said plurality of compartments placed along the sample forwarding direction of said channel are configured so that the one placed on the further downstream side of said channel is imposed with a smaller external force in said individual external force imposing patterns.

13. The separation apparatus according to any one of Claims 1 to 12, wherein said components-to-be-separated are fractionated into any of said compartments depending on migration ranges caused by imposition of said external force.

14. The separation apparatus according to any one of Claims 1 to 13, further comprising a recovery unit provided on the downstream side of said channel,

wherein said external force imposing unit is configured so as to gradually elongate imposition time of the external force in

said individual imposing patterns, so that fractions of said components-to-be-separated can sequentially be obtained from said recovery unit.

15. The separation apparatus according to any one of Claims 1 to 14, wherein said external force imposing unit is configured so as to execute an external force imposing pattern specialized for recovery, in which the external force is imposed in the forward direction of said channel for a duration of time longer than that in said individual external force imposing patterns, and configured so as to recover said components-to-be-separated from the compartment placed furthest on the downstream side of said channel, through execution of said external force imposing pattern specialized for recovery.

16. A separation apparatus comprising:

a channel having a main channel and sub channels formed as being branched out from said main channel, through which a sample including components-to-be-separated moves; and

an external force imposing unit imposing external force to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force imposing unit is configured so as to sequentially execute a plurality of external force imposing patterns differing in direction of imposition of the external force relative to said channel, and said apparatus is configured so as to fractionate said components-to-be-separated into any of said sub

channels, through execution of said plurality of external force imposing patterns.

17. The separation apparatus according to Claim 16, wherein said main channel has a sample introduction port; and

said sub channels are configured so as to have said components-to-be-separated introduced thereinto when said external force imposing unit imposes external force towards the sample introduction port, and so as to move said components-to-be-separated towards said main channel when said external force imposing unit imposes external force in the direction departing from said sample introduction port.

18. The separation apparatus according to Claim 16 or 17, wherein said main channel has a sample introduction port; and each of said sub channels has a length almost equal to that of a portion of said main channel ranging from a point where said sub channel branches out from said main channel to said sample introduction port.

19. The separation apparatus according to any one of Claims 16 to 18, wherein said main channel has a sample introduction port; and each of said channels has a length longer than that of a portion of said main channel ranging from a point where said sub channel branches out from said main channel to said sample introduction port.

20. The separation apparatus according to any one of Claims 16 to 19, further comprising a check valve provided on the upstream side

and in the vicinity of a point where said sub channel branches out from said main channel.

21. A separation method using a separation apparatus comprising a channel through which a sample containing components-to-be-separated moves, a plurality of compartments provided to said channel, and an external force imposing unit imposing external force to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force is repetitively imposed sequentially in the direction departing from a sample introduction position and in the direction approaching the position on said channel, to thereby fractionate said components-to-be-separated into any of said compartments.

22. The separation method according to Claim 21, wherein said components-to-be-separated are fractionated into any of said compartments depending on migration ranges caused by imposition of said external force.

23. A separation method separating components in a sample using the separation apparatus described in any one of Claims 1 to 15, comprising:

a step of introducing said sample into said channel;

a first step of executing any one of said external force imposing patterns so as to move, within one compartment, said sample towards the downstream side of said channel;

a second step of executing any one of said external force imposing patterns so as to move, within one compartment, said sample towards the upstream side of said channel;

wherein these steps being sequentially repeated.

24. The separation method according to Claim 23, wherein duration of time of imposing the external force is kept constant for every execution, in said external force imposing pattern in said first step.

25. The separation method according to Claim 23, wherein duration of time of imposing the external force is kept constant for every execution, in said external force imposing pattern in said first step, and in said external force imposing pattern in said second step.

26. The separation method according to any one of Claims 23 to 25, wherein duration of time of imposing the external force in said external force imposing pattern in the second step is adjusted to substantially equal to, or longer than the duration of time of imposing the external force in said external force imposing pattern in the first step.

27. The separation method according to any one of Claims 23 to 26, repetitively executing said first step and said second step, then executing the step of introducing said sample again, and further repeating these steps.

28. The separation method according to any one of Claims 23 to

27, wherein in said external force imposing pattern in said first step, and in said external force imposing pattern in said second step, said first step and said second step are repetitively executed while keeping duration of time of imposing the external force constant for every execution, and similar process is repeated thereafter under an elongated duration of time of imposing the external force in said external force imposing pattern in at least said first step.

29. The separation method according to any one of Claims 23 to 28, further comprising a step of executing an external force imposing pattern specialized for recovery, in which the external force is imposed to said sample so as to allow it to move towards the downstream side of said channel, for a duration of time longer than the duration of time of imposing the external force in said external force imposing pattern in said first step.

30. A separation method separating components in a sample using the separation apparatus described in any one of Claims 16 to 20, comprising:

a step of introducing said sample into said channel;

a first step of executing, in said main channel, any one of said external force imposing patterns so as to move said sample towards the downstream side of said channel;

a second step of executing, in said main channel, any one of said external force imposing patterns so as to move said sample towards the upstream side of said channel;

wherein these steps being sequentially repeated.

31. The separation method according to Claim 30, wherein in said external force imposing pattern in said first step, duration of time of imposing the external force is kept constant for every execution.

32. The separation method according to Claim 30 or 31, wherein duration of time of imposing the external force in said external force imposing pattern in the second step is adjusted to substantially equal to, or longer than the duration of time of imposing the external force in said external force imposing pattern in the first step.

33. The separation method according to any one of Claims 30 to 32, repetitively executing said first step and said second step, then executing the step of introducing said sample again, and further repeating these steps.

34. A system comprising an external force switching control unit executing the method described in any one of Claims 21 to 33.

35. A mass spectrometry system comprising:

a pre-treatment unit separating a biological sample depending on the molecular size or properties, and subjecting said sample to a pre-treatment for an enzyme digestion treatment;

a unit subjecting said sample pre-treated by said pre-treatment unit to the enzyme digestion treatment;

a drying unit drying the enzyme-digestion-treated sample; and

a mass spectrometry unit subjecting the dried sample to mass

spectrometry, wherein

said pre-treatment unit comprises a microchip described in any one of Claims 1 to 20.